SHORTER ARTICLES AND DISCUSSION

A CROSS INVOLVING FOUR PAIRS OF MENDELIAN CHARACTERS IN MICE

THE present experiment was planned as a control upon more detailed work being carried on at the Bussey Institution. It has, however, a distinct value, as demonstrating from a single cross the existence of four independent pairs of Mendelian characters in the color inheritance of mice.

That the yellow and agouti factors are not inherited independently of each other has been demonstrated by Sturtevant.[1]

The four pairs of characters under consideration here were recorded by Castle and Little[2] and are briefly as follows:

> A = agouti, a = non-agouti.
> B = black, b = no black (brown).
> D = density, d = diluteness.
> P = dark eye, p = pink eye.

In each case the character represented by the small letter is recessive in combination with its allelomorph, designated by a large letter.

To obtain all possible combinations of these four pairs of characters, a single pure wild gray mouse was mated with several pink-eyed dilute brown females from a homozygous stock bred at the Bussey Institution and shortly to be reported upon by one of the writers.

Wild gray mice possess the dominant members of all four paired characters mentioned above, and consequently have the gametic formula ABDP. The pink-eyed dilute brown mouse, on the other hand, exhibits the recessive conditions of the same factors and is of the formula abdp. It is in appearance a very pale lilac color and in Miss Durham's classification is described as "Silver Champagne."[3]

The F_1 individuals resulting from this cross (wild ♂ × pink-eyed dilute brown ♀) were all, as expected, similar to the wild

[1] AM. NAT., 1912, p. 368.
[2] *Science,* 1909, p. 312.
[3] *Journal of Genetics,* 1911, p. 159.

parent in color.   They were mated *inter se* and disposed so as
to raise as large a number of F_2's as possible.

In this F_2 generation we should expect to find sixteen visibly
different types of color, in the proportions indicated in Table I.
Table I also shows the results actually obtained in the experiment.

TABLE I

Color	Formula	Observed Numbers	Expected Numbers	Theoretical Proportion	Observed Proportion
Black Agouti.............	ABDP	436	373.4	81	94.5
Black..................	aBDP	127	124.5	27	27.5
Brown Agouti............	AbDP	103	124.5	27	22.3
Dilute Black Agouti.......	ABdP	130	124.5	27	28.2
Pink Eyed Black Agouti...	ABDp	103	124.5	27	22.3
Brown..................	abDP	40	41.5	9	8.7
Dilute Brown Agouti......	AbdP	31	41.5	9	6.7
Dilute Black.............	aBdP	37	41.5	9	8.0
Pink Eyed Black..........	aBDp	35	41.5	9	7.6
Pink Eyed Brown Agouti...	AbDp	38	41.5	9	8.2
Pink Eyed Dilute Black Agouti.................	ABdp	38	41.5	9	8.2
Dilute Brown............	abdP	11	13.8	3	2.4
Pink Eyed Brown.........	abDp	12	13.8	3	2.6
Pink Eyed Dilute Brown Agouti.................	Abdp	15	13.8	3	3.3
Pink Eyed Dilute Black ...	aBdp	17	13.8	3	3.7
Pink Eyed Dilute Brown...	abdp	7	4.6	1	1.5
Total.................		1,180			

If we consider each allelomorphic pair of characters sepa-
rately, the following results are observed (Table II):

TABLE II

Characters	Observed Numbers	Expected Numbers	Theoretical Proportions	Observed Proportions
A	894	885	3	3.12
a	286	295	1	1
B	923	885	3	3.59
b	257	295	1	1
D	894	885	3	3.13
d	286	295	1	1
P	915	885	3	3.45
p	265	295	1	1

It will be seen that there is in each case a slight excess of
animals possessing the dominant character.   Further, in Table I
there was an excess of black agouti (gray) animals, which possess
all four dominant characters.

This last excess, however, is not sufficient, in the opinion of the writers, to support any theory of coupling, especially in the absence of significant differences in the other classes.

The excess of grays may better be explained on the basis of selective elimination of the various recessive animals, for the F_2 young could not be graded satisfactorily until nearly four weeks old, and no account was kept before this time.

A minor error may have occurred in recording the pink-eyed dilute brown young, as they resemble closely the intense pink-eyed brown and no breeding test was undertaken.

To summarize the results of this mating, it is obvious that we are dealing with four clear-cut pairs of Mendelian characters as described by Castle and Little in 1909, among which no coupling or association can be detected.

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